

Smallholder Teak and Agrarian Change in Northern Laos

Jonathan C. Newby · R. A. Cramb ·
Somphanh Sakanphet · Sean McNamara

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Abstract Smallholder teak (*Tectona grandis*) plantations have become increasingly prominent in the landscape of Luang Prabang Province, Lao PDR. While the global market for teak-wood is attractive, investment has been driven by a range of factors, including changes to land legislation, land-use planning, taxation incentives, and government and non-government programs and promotions. The establishment of teak stands provides a labour-saving land use for households, potentially freeing up household resources for other farm and non-farm opportunities. However, the degree to which households can participate in the industry varies within and between villages. This paper reviews some of the underlying incentives for the expansion of teak plantations, examines the livelihood activities of both teak and non-teak producers in five case study villages in Luang Prabang, and explores the differential outcomes emerging from the expansion of smallholder teak production. The survey revealed that teak planting has been more extensive among households with a longer history of settlement, where the household head is older and better educated, where household members have off-farm sources of income, and where the household has access to paddy land and is thus more likely to be self-sufficient in rice. Households that depend on shifting cultivation for their livelihoods, without access to alternative productive land or income sources, will continue to have difficulty planting teak or holding on to the land they do manage to plant. The paper

J. C. Newby · R. A. Cramb · S. McNamara
School of Agricultural and Food Science, The University of Queensland, St Lucia, QLD 4072,
Australia

S. Sakanphet
Northern Agriculture and Forestry Research Center (NAFReC), Houay Khot Agricultural Research
Station, Xieng Ngeun District, Luang Prabang, Lao PDR

J. C. Newby (✉)
Agriculture and Forestry Policy Research Centre (AFPRC), National Agriculture and Forestry
Research Institute (NAFRI), P.O. Box 7170, Vientiane, Lao PDR
e-mail: j.newby@uq.edu.au

concludes that the establishment and improvement of teak plantations, like other apparently technical interventions aimed at providing a ‘pathway out of poverty’, need to be seen in the context of wider processes of agrarian change and differentiation to appreciate the resultant impacts on livelihood trajectories.

Keywords Upland farming systems · Shifting cultivation · Tree farming · Land-use policy · Agrarian differentiation · Lao PDR

Introduction

The World Bank (2007) has identified three potential ‘pathways out of poverty’ for poor rural households—moving from subsistence to commercial farming, undertaking non-farm activities in rural areas, and migration out of rural areas. Smallholder tree farming has been widely advocated as one component of the agricultural commercialisation pathway in upland environments (Snelder and Lasco 2008). However, the belief that the adoption of commercial tree crops can lift whole rural populations out of poverty ignores both the initial diversity within these communities and the disequalising processes involved in such a transition. Li (2009) and Rachman et al. (2009) explicitly criticised the World Bank’s (2007) failure to appreciate the ways in which technical interventions to help farmers commercialise their operations can be systematically linked to the impoverishment of other farmers, through the loss of access to land and other resources. Hence planned agricultural development pathways need to be seen in relation to internal and external processes of agrarian change and differentiation.

In Laos, smallholder teak (*Tectona grandis*) plantations have been identified as a potentially valuable component of upland farming systems, enabling subsistence shifting cultivators to move into commercial agriculture and out of poverty, conforming to the World Bank’s first pathway. Teak planting commenced more than 50 years ago in Luang Prabang Province in northern Laos, but a rapid expansion has occurred in the last 20 years with over 10,000 ha of smallholder teak now established in the province (Midgley et al. 2007). This crop provides very high returns, especially in relation to current household incomes, and has good long-term market prospects. Furthermore, improved management and marketing practices have the potential to increase the returns to households with teak. A project in Luang Prabang funded by the Australian Centre for International Agricultural Research (ACIAR) is aimed at enhancing on-farm incomes through improved teak management and agroforestry systems. This project is evaluating various teak production systems in relation to alternative land uses, including assessing the social, economic and environmental impacts of changing land-management practices.

As part of the ACIAR project, in 2009 a survey was conducted of 127 farm households in five teak-growing villages in Luang Prabang. The purpose of the survey was to understand the various influences on, and the differential impacts of, the adoption of teak planting and improved management by farmers in the province. There is considerable diversity both within and between teak-growing villages in Luang Prabang. This includes diversity in ethnicity, relocation history, access to

land resources, alternative farming opportunities (including paddy land and river gardens), road infrastructure and access to markets, access to extension activities (teak and other livelihood projects), and local-level implementation of government policies. It was hypothesised that these factors would all influence farmers' ability to adopt teak production systems and hence give rise to differential impacts of smallholder teak initiatives (including the ACIAR project) on household livelihoods.

This paper first outlines the changes in government policies and planning related to land tenure, forestry, shifting cultivation and taxation that have stimulated the expansion of teak plantations in Luang Prabang. The main part of the paper reports findings on the differences within and between villages in the uptake and impacts of teak planting and management by comparing the resources and activities of households in the five case-study villages. The paper concludes with a discussion of the implications of these findings for understanding the role of teak planting in agrarian differentiation.

External Influences on Smallholder Teak Planting

Influence of Land Policy on Teak Planting

A major influence on teak planting in Laos has been the government's Land and Forest Allocation (LFA) Policy (Fujita 2010). The LFA process began in the early 1990s and has been progressively codified into law (Ducourtieux et al. 2005). Initially, households could enter into an agreement for the management and use of degraded forest or non-forest land for agriculture, forestry and livestock production 'in order to upgrade the village family's living conditions' (PM Decree No. 169/1993). After 3 years, if a household had complied with the conditions of the contract, it could receive permanent tenure, including the right to transfer and bequeath land and to use land as collateral (PM Decree No. 169/1993). The land allocation process was further consolidated into a national program under PM Decree No. 3/1996. A specific decree on Allocation of Land and Forest Land for Tree Plantation and Forest Protection (PM Decree No 186/1994) also enabled allocation of land for these purposes.

The *Land Law 1997* (amended in 2003) and *Forestry Law 1996* (amended in 2005 and 2007) provide the current framework for the eradication of shifting cultivation and the encouragement of sedentary agriculture, including the establishment of tree plantations (GoL 1996, 2003, 2007). The state authorises individuals and households to use agricultural land in accordance with a local allocation plan and objectives, with the maximum area available to a household based on the type of agriculture and the number of labour units (i.e. people aged 14 years or over and capable of work) in the household. The area allocated includes up to 3 ha of degraded forest land where plantation activities are to be focused. Degraded forest land is defined as forest that has been extensively modified—mainly land previously used for shifting cultivation. If a household does not utilise the land it has been allocated within 3 years it may lose access to this land. The law

requires that a plot that has been abandoned for over 3 years be returned to the village committee for redistribution to other farmers within the village who can make use of it (Ducourtieux et al. 2005). As a result, many farmers have planted teak on the plots they do not currently need for food crops to retain them for the future (Kolmert 2001; Midgley et al. 2007).

The new framework created the security of tenure that enabled and encouraged investment in tree plantations. However, the process also created an incentive for households to convert swidden land (that would be classified as degraded forest land) into plantations prior to implementation of the allocation process. This meant that the household may be allocated additional land for the purpose of growing cash crops, and at the same time keep the plots that had been previously planted with teak (Kolmert 2001). According to Kolmert (2001), this disadvantaged farmers in the villages where the LFA process first took place because those farmers did not know how the process would work, and did not have time to plant teak to gain access to more land. Moreover, households arriving more recently in an area (either as part of a resettlement program or through voluntary migration) could not take advantage of this transitional period and now have limited access to land due to the expansion of plantations on land that may previously have been forfeited and been reallocated by the village committee.

As part of its land-use policies, the Government of Laos (GoL) has persistently sought to reduce and eventually eradicate shifting cultivation and opium production (GoL 2005). Shifting cultivation has previously been identified by the GoL as one of the main causes of forest loss, especially in the northern provinces. While some officials have acknowledged that limiting fallow periods to three or 4 years may cause problems of reduced soil fertility and increased weed growth, in February 2010 the Government reaffirmed its stance to eradicate long-fallow shifting cultivation completely by 2010 (GoL 2010). Commercial tree plantations have been promoted as an alternative to shifting cultivation.

Promotion of Teak Planting and Farmers' Responses

Private teak plantings have been recorded in northern Laos since the 1950s (Midgley et al. 2007). In the past these plantations have largely been confined to areas close to roads or rivers, which allowed efficient access and transportation of logs to mills. Households engaged in shifting cultivation have been aware of teak plantations since this early stage. The then Department of Forestry and Water (DFW) commenced a teak plantation program in 1950, plantations being established by shifting cultivators on land belonging to the DFW. The households took care of the plantations during the first 2 years and inter-planted the trees with food crops, mainly upland rice. After harvest of the intercrops, the DFW took over ownership and management of the plantation (Kolmert 2001).

After the formation of the Lao PDR in 1975, the Government made tree planting a national priority, with a variety of laws and decrees supporting and promoting plantation development. The National Socio-Economic Development Plan (2001–2006) strongly promoted tree planting for commodity production and set a national target of 134,000 ha for the 5-year period to 2005 (GoL 2005). To achieve

this target the government's strategy was to provide a range of incentives, including the allocation or lease of land for tree planting, recognition of individual property rights to planted trees, exemption from land tax for registered plantations, and free distribution of seedlings to farmers and farm organizations. Teak plantations were seen as a promising option for subsistence farmers looking for a marketable commodity. The Forestry Strategy to the Year 2020 (GoL 2005) again included: extension for tree improvement, plantation management and cutting methods; support for farmer organizations, marketing and product development; providing additional land; financing farmers involved in teak planting; and the formation of teak growers' groups.

According to Kolmert (2001), there was a boom in teak planting in Luang Prabang in 1988 and another larger one in 1996, after which the rate of planting decreased, mainly for political reasons. Nevertheless, the total area has increased from 500 ha to over 10,000 ha in the past 20 years (Kolmert 2001; Midgley et al. 2007). Researchers have identified a variety of reasons why farmers have planted teak (Hansen et al. 1997; Kolmert 2001; Midgley et al. 2007), including:

- depletion of wood supply from natural forest and the emergence of a market for relatively young teak timber (15–20 years old);
- secure private land tenure (since 1990s);
- permanent settlement pattern adopted by most villages;
- expansion of the road system;
- land allocation schemes that gave additional land for production of perennials;
- promotion of tree planting by private investors through financial support, the production of stumps, and information dissemination; and
- promotion and extension by government agencies (as described above).

Roder et al. (1995) found that ethnic Lao households tended to plant more teak than other ethnic groups. They attributed this to the tendency for Lao households to be permanently settled in an area for a longer duration than other ethnic groups, to have better access to official information, and to have a higher degree of rice security.

According to Hansen et al. (1997), the best role for teak is as a supplement to shifting cultivation by planting teak on part of the land while continuing upland cropping on other land. Small plantations would be suitable for most farmers if they applied proper management and retained ownership. Hansen et al. (2005) suggested the establishment of smaller plantations of 50–200 trees that farmers would be able to maintain over many years with better management techniques and would therefore be less likely to sell before harvest. However, the expansion of teak plantations has not been followed by improved management of standing trees. Several studies conducted in Luang Prabang have identified the need for improved management, especially thinning and pruning (Roder et al. 1995; Hansen et al. 1997; Hansen et al. 2005; Keonakhone 2005; Midgley et al. 2007). It has been suggested that well-known management techniques could be applied to increase the volume and value of merchantable timber from existing plantations, but adoption of these techniques by farmers has been limited.

A preliminary assessment of teak systems in Luang Prabang by Midgley et al. (2007) compared various land-use options based on their gross margins. These authors recommended that a full assessment should also take into account the total and seasonal availability of resources, such as family labour and land suitable for particular uses. However, such analyses also need to recognise the diversity in individual household circumstances within and between upland communities, including diversity in access to resources and in livelihood strategies, giving rise to differing responses to the promotion of teak. This diversity is explored in the analysis of survey data in the next section.

Survey Methods and Findings

Methods

In November 2009 a survey of 127 households in five teak-growing villages was carried out in four districts of Luang Prabang Province (Luang Prabang, Xieng Ngeun, Chomphet, and Nan Districts) to explore the differences within and between villages in teak planting and management. The five villages were selected to highlight differences in proximity to Luang Prabang City, ethnicity, resettlement history, population density, and other land-use opportunities. The selected villages were Ban Kok Ngiou, Ban Xienglom, Ban Phonsavang, Ban Phatonglom, and Ban Sanok (Fig. 1).

Sampling of households within these villages was carried out with the assistance of the village headman (*ni ban*) and members of the village committee, who also acted as key informants for the study. To ensure representation of the various different types of households, the researchers requested the village leaders to select households reflecting differences in location within the village, access to paddy, and extent of teak planting (including those without teak). All selected households agreed to participate in the survey. As well as the process of effectively stratifying the samples, the sample sizes (21–29 households per village) and sampling fractions (15–33%) gave reasonable assurance that the samples were representative (Table 1). About 81% of the surveyed households had planted teak, averaging 1,330 trees per household across the five villages. However, the sampling was not able to capture absentee landholders whose holdings represented a large proportion (up to 50%) of the planted teak area in the more accessible parts of Luang Prabang.

Project field staff conducted a structured interview with the household head or an older household member. The questionnaire sought information regarding the household's composition, settlement and relocation history, cropping and livestock activities, the collection, consumption and sale of non-timber forest products (NTFP), off-farm and non-farm employment, access to extension services and other sources of information, access to credit, land transactions, rice self-sufficiency, and household assets. For those households with teak plantations, additional information was sought regarding the number of blocks planted, number of trees, timing of planting, spacing between trees, planting of companion crops, and respondent's knowledge of silvicultural practices.

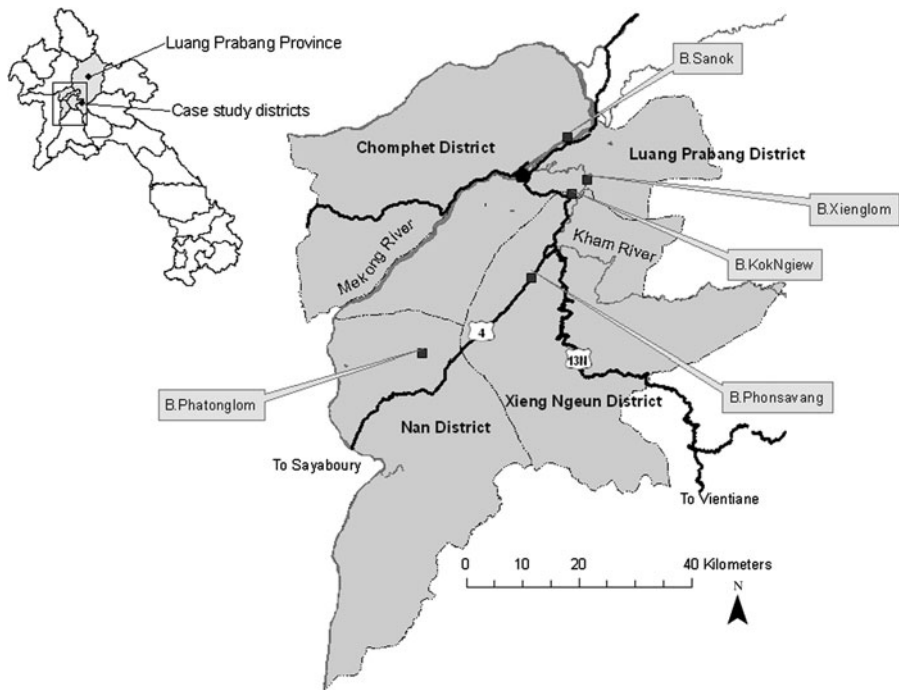


Fig. 1 Location of case-study villages in Luang Prabang Province

Table 1 Survey sampling details by case-study village

Village	Kok-Ngiou	Phatong-lom	Phon-savang	Sanok	Xieng-Lom	Total
District	Luang Prabang	Nan	Xieng Ngeun	Chomphet	Luang Prabang	
Village population	1,020	590	446	346	713	3,115
No. of households in village	191	99	76	65	157	588
No. of households surveyed	29	25	25	21	27	127
Sampling fraction (%)	15.2	25.3	32.9	32.3	17.2	21.6
No. of households surveyed with teak	26	14	25	15	23	103
Average no. trees per household with teak	1,234	749	2,106	1,550	2,185	1,329
Largest holding (trees/household)	4,500	3,000	20,400	3,050	7,800	20,400

Timing and Extent of Teak Planting

The pattern of planting reported in the household survey showed a few years of extensive planting during the 1990s, consistent with Kolmert's (2001) finding that

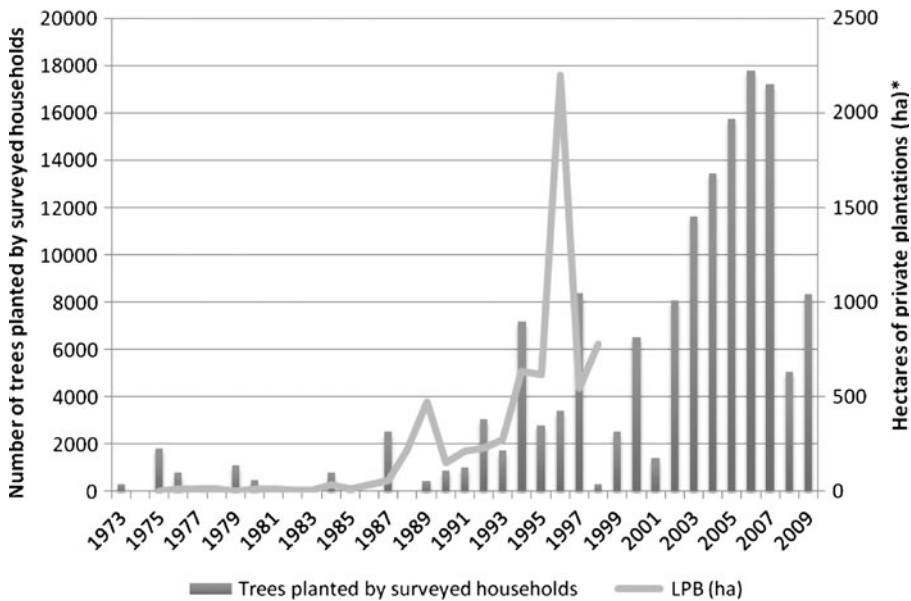


Fig. 2 Number of teak trees planted by survey respondents annually (1973–2009) compared with Kolmert's 2001 data on area of teak planted in Luang Prabang Province (1975–1998)

Table 2 Timing of land allocation in the case study villages

Village	Kok-Ngiou	Phatonglom	Phonsavang	Sanok	Xieng-Lom
Year of land allocation	1996	1995	1995	2005	1996
Year certificate received	1996	2005	1995	2005	2005
Year title issued		2009			

there was a small boom around that time. However, the real boom in teak planting has occurred in the 2000s (Fig. 2). The data suggest that this more recent rapid expansion in planting was not primarily due to strategic planting to take advantage of the LFA process, which was mostly in 1995–1996 (Table 2). Rather, it appears to be related to factors such as the implementation of restrictions on shifting cultivation, the new ability to transfer land, and the improvement in road infrastructure and market opportunities. Furthermore, early adopters are now able to reap the benefits of their plantations as the trees have reach harvest age, and seeing this has encouraged other households to adopt.

The size of teak plantations varied widely within and between villages (Table 1). The overall mean plantation size of the survey households was about 1,330 trees (1.4 ha) but varied from 750 trees in Ban Phatonglom to 2110 trees in Ban Phonsavang. The distribution of plantation size positively skewed, so the average plantation size was inflated by a small number of larger plantations (Fig. 3). About 20% of households surveyed had never planted teak, and 40% had planted less than 1,000 trees. The largest 10% of plantations had holdings over 3,000 trees and ranged up to 20,000 trees.

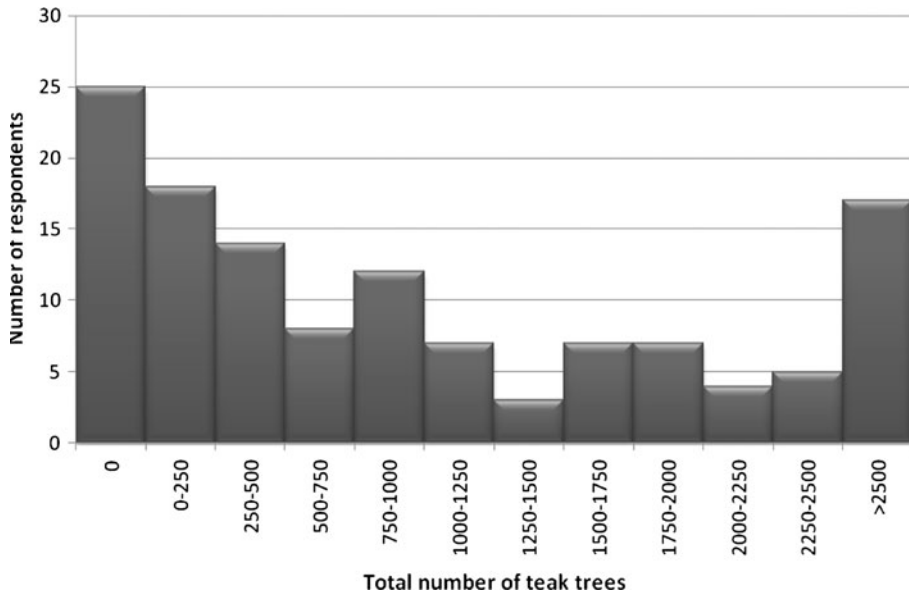


Fig. 3 Distribution of plantation size (number of trees)

Table 3 Survey households classified by number of teak trees and village

Teak Group	Number of teak trees per household	Kok Ngjou	Phatonglom	Phonsavang	Sanok	Xieng Lom	Total
A	0	4	11	0	6	4	25
B	<500	9	6	2	2	7	26
C	500–999	5	4	4	3	3	19
D	1,000–1,999	5	3	14	3	3	28
E	>2,000	6	1	5	7	10	29

It was hypothesized that the degree to which households are able to participate in teak planting and improved management is largely determined by the resources available to them, especially land. Within each community, access to resources is influenced by a range of factors, including age, ethnicity and settlement history. An exploratory analysis of these factors was undertaken based on conventional statistical comparison of means and proportions between groups of respondents. Households were classified into five size groups (A–E), based on the number of teak trees they had planted, with Group A having no teak and Group E having 2,000 or more trees (Table 3).

Demographic and Ethnic Characteristics

The average number of persons per household was 5.7 (Table 4). Households with teak (Groups B to E in Table 3) tended to be smaller, better educated, with

Table 4 Household composition by number of teak trees (teak group)

Household composition	Teak group					
	A	B	C	D	E	Total
No. in household	6.5	5.2	5.5	5.7	5.7	5.7
No. full-time farm workers	2.7	2.8	2.0	2.2	2.3	2.4
No. off-farm workers	0.3	0.5	0.8	0.9	1.1	0.7
No. students	2.1	1.5	2.2	2.3	1.9	2.0
No. dependants	1.4	0.3	0.5	0.3	0.3	0.6
Age of household head (years)	37.5	47.5	40.8	47.1	48.1	44.6
Edcn. of household head (years)	4.1	5.0	6.4	5.1	6.2	5.3
Max. education. in household (years)	6.5	9.0	9.7	10.5	11.1	9.4

significantly ($P < 0.01$) fewer dependants than non-teak households (Group A). This is to be expected given that, on average, the heads of teak-growing households were also older.

There was a significant positive correlation between planting teak and the educational attainment of the household, though the causal link was in both directions. Table 4 shows that the education level of the household head and the maximum education level of any household member were higher for teak households and tended to increase with the number of trees planted. There was some evidence that teak planting led to increased education levels. Some respondents reported using income from teak to pay for school fees. In particular, some households that had sold teak plantations (i.e. standing trees and land) reported using the proceeds to send children to school and university. Moreover, the reduction in the overall requirements for family labour through converting cropland to teak plantations would have freed up children's time to attend school. Nevertheless, there was no significant difference in mean educational attainment of the most educated household member between those households that had planted teak but were yet to harvest any trees (10.0 years education) and those that had already begun to harvest trees for sale (10.5 years education), though the mean educational attainment of the most educated household member for both groups was significantly higher than for households that had never planted teak (6.5 years). This suggests that the ability to send children to school was dependent on income from other livelihood activities, which may have also been an enabling factor in the decision to plant teak.

The average number of off-farm workers per household was also positively correlated with the number of trees planted. Those households with alternative income sources had a greater ability to meet food requirements through purchases, hence they were better able to convert cropland to tree plantations without reducing household food security.

During the interviews with the village heads, the ethnic composition of the village was obtained along with other village statistics. The proportion of different ethnic groups in the sample was consistent with the overall occurrence of ethnic

Table 5 Number of households planting teak, by ethnic group

Ethnic group	Teak group					Totals
	A	B	C	D	E	
Hmong	6	0	0	0	0	6
Khmu	15	14	11	20	8	68
Lahu	0	0	0	0	1	1
Lao	4	12	8	7	20	51
Phunoi	0	0	0	1	0	1
Totals	25	26	19	28	29	127

groups in the villages; Khmu and Lao households dominated the sample, which also included other ethnic groups (Table 5).

There was a higher incidence of teak planting among the Lao households in the sample (92%) than the other ethnic groups, and Lao households were strongly represented in the largest plantation size class (Group E). Much of the variation between ethnic Lao and Khmu households in the survey resulted from the inclusion of Ban Phatonglom, a village with a dominant Khmu population where most households had not planted teak. The high percentage of Lao in Group E is to some extent attributable to the extensive teak planting activities in Ban Xieng Lom and Ban Sanok, both of which have large ethnic Lao populations with a longer history of settlement, confirming the findings of Roder et al. (1995).

There was only a small Hmong population in the study villages. These households had relocated from other villages within Luang Prabang or nearby provinces. Often they had little or no land allocated to them and so were not able to participate in teak planting. However, anecdotal evidence from the study villages and other surrounding villages suggests that longer-settled Hmong families living in other areas, such as Luang Prabang City, are participating in the teak industry by acquiring land planted with teak.

Access to Land and Crop Activities

The maximum allocation of land to households as set out in the *Land Law 1997* (amended in 2003) is based on the number of household units of labour. However, in practice, the initial LFA process at the village level varies considerably and is subject to change after the process is complete (NAFRI 2007). While the Land Law allows for 1 ha of paddy per labour unit, the amount of paddy land available within the study villages was insufficient to provide each household with this amount. During the allocation process paddy land was often retained by those already using it, hence the distribution of land by area and productivity was not uniform.

Respondents reported the area of their paddy land and the number and area of their cultivated upland parcels, fallowed parcels, and timber (predominantly teak) parcels (Table 6). Many respondents had difficulty distinguishing between currently cropped and fallowed land because these parcels regularly move in and out of

Table 6 Access to land resources and cropping activities

	Teak group					
	A	B	C	D	E	Total
Parcels (mean number per household)						
No. upland parcels	1.7	1.9	2.1	1.7	1.6	1.8
No. parcels of fallow	1.9	1.3	0.9	0.7	0.8	1.1
No. parcels of timber land	0.2	0.9	1.5	1.8	2.8	1.5
Total parcels	3.8	4.1	4.5	4.2	5.1	4.4
Fallow/upland parcels	1.1	0.7	0.4	0.4	0.5	0.6
Land area (mean hectares per household)						
Area of paddy rice	0.3	0.3	0.3	0.4	0.6	0.4
Area of upland	1.4	1.5	1.4	1.2	1.0	1.3
Area of fallow	1.5	1.2	1.0	0.5	0.7	0.9
Area of timber land	0.2	0.4	0.7	1.2	2.1	1.0
Total area	3.3	3.4	3.5	3.3	4.5	3.6
Fallow/upland area	1.1	0.8	0.7	0.4	0.7	0.7
% timber land	5.4	12.5	21.3	37.6	47.0	27.3
Paddy rice						
% households with paddy	36.0	50.0	31.6	60.7	69.0	51.2
Area of paddy (ha/paddy hh)	0.7	0.7	1.0	0.6	0.8	0.38
Upland cropping (% of households)						
Any upland crop	88.0	84.6	84.2	64.3	62.1	75.6
Rice	59.1	36.4	25.0	16.7	33.3	35.4
Corn	45.5	22.7	18.8	33.3	33.3	31.3
Jobs tears	18.2	27.3	37.5	44.4	22.2	29.2
Sesame	18.2	9.1	12.5	11.1	33.3	16.7
Pineapple	13.6	36.4	31.3	16.7	22.2	24.0
Banana	4.5	18.2	43.8	44.4	38.9	28.1

cultivation. The process was further complicated by households not wanting to be seen to be violating the government policy on shifting cultivation. This was more prevalent in some villages, where farmers would talk about parcels of *suan khao* (rice gardens) rather than *hai*, the term for swidden or shifting cultivation fields.¹

The ratio of fallow to upland area was lower for those households with more teak because these households had used fallow land to plant teak (Table 6). This resulted in shorter rotations on the remaining upland or a higher incidence of perennial crops, particularly pineapples and bananas. However, these households were also more likely to have access to paddy land, and so were more likely to be self-sufficient in rice; only 28% of non-teak households were self-sufficient whereas over 50% of teak households were self-sufficient. While not having paddy land did

¹ Barney (2007) reported a similar problem in Hinboun District, Khammouane Province, and suggested that some flexibility between the terms *hai* and *suan* is required to solve the problem of implementing the official swidden stabilization or eradication policy.

not necessarily mean a household would not have teak, all those households that did have paddy also had teak plantations, with the exception of households at Ban Phatonglom. Further, the average number of trees planted, and thus the area converted to teak, was significantly larger for households with paddy land.

The dominant upland crops in Table 6, with the exception of rice, were more a function of village location than the extent of teak planting. Pineapples were common in Ban Kok Ngiou, Jobs tears (*Coix lacryma-jobi*) and bananas in Ban Phonsavang, corn in Ban Phatonglom, and sesame in Ban Sanok. This pattern is thought to be related to previous development projects and the presence of traders who often promote and provide inputs for specific crops. In Ban Sanok the sesame was grown to be added to the river weed that was harvested and sold in Luang Prabang and as a local delicacy (*khai paen*).

Another important livelihood activity in Ban Xienglom and Ban Sanok was managing vegetable gardens, along the banks of the Khan and Mekong rivers respectively. These were often reported to be the main income-generating activity. The collection of non-timber forest products (NTFPs) was also an important activity for many households, especially in Ban Phonsavang. Products included broom grass, paper mulberry, bamboo, mushrooms, forest vegetables and rattan. Trials are continuing in the ACIAR project to evaluate paper mulberry and rattan as companion crops grown with teak that may potentially provide an intermediate source of income once annual cropping between the teak trees is no longer possible. This is especially likely to be the case for households with access to small areas of land; those with more land, hence alternative livelihood options, would find the labour requirements of these companion crops a disincentive to adoption.

Livestock Activities and Teak Planting

Rearing small and large livestock is an economically important activity for many households. Cattle ownership was negatively correlated with the number of teak trees planted. This relationship was particularly evident in Ban Phatonglom where there was low adoption of teak and a large number of cattle. While Group A households (those with no teak) were more likely to have cattle, those with teak who also had cattle were more likely to have a larger herd. On the other hand, buffaloes were more common among teak households than non-teak households, but only a few households had buffaloes.

In Ban Phatonglom, when respondents were asked if there was any other information they would like to provide, many indicated their interest in maintaining land for pasture rather than establishing teak, and requested support to improve their livestock productivity. The extent to which livestock and tree crops compete for land is subject to continuing research but has been identified as an issue for farmers in other areas of Laos where rubber plantations have expanded.

Management and Marketing of Teak

Table 7 shows the percentage of teak-growing households that had had training in, knew how to, and had adopted thinning and pruning. While about 40% of

Table 7 Knowledge and adoption of thinning and pruning of teak (% of households in each size group)

	Teak group				
	B	C	D	E	Total
Had training in pruning	12	0	32	17	17
Know how to prune	15	26	32	45	30
Had done pruning	35	42	36	52	41
Had training in thinning	4	0	29	17	14
Know how to thin	0	11	11	7	7
Had done thinning	0	11	14	10	9

households had done some pruning, only 9% had done any thinning. The data also suggest that although individuals had attended training events on thinning, they were not confident they knew the appropriate method. Similarly, about a quarter of those farmers who reported that they had done some pruning were still not sure of the appropriate method.

The frequencies presented in Table 7 were influenced by the age structure of the teak plantations captured in the survey. The younger plantations were not yet at the stage when thinning and pruning is required. However, the limited knowledge among farmers highlights the importance of conducting extension activities on these techniques as the appropriate time for their adoption approaches. Surveys conducted with farmers prior to training workshops further highlighted that the majority of participants were unaware of any benefits of pruning their trees, and about half did not perceive any benefits from thinning their plantations.

Prior experience with marketing harvested teak was also limited among the households surveyed. About 68% of those households that had planted teak were yet to harvest any trees, and a further 18% had sold less than 50 trees, reflecting the age structure of the teak plantations (Table 8). To date the sale of trees has been dominated by those villages with the longer history of teak growing; in the survey, about two-thirds (67%) of reported harvested trees were from households in Ban Xieng Lom. In Ban Phonsavang, where the teak boom occurred more recently, only one of the households surveyed had begun to harvest and sell trees.

Table 8 Incidence of harvesting and selling teak (as a percentage of households that had planted teak)

Number of trees sold	Teak group				
	B	C	D	E	Total
No. trees sold	77	74	79	45	68
50 trees or less	19	11	14	24	18
100–500 trees	4	16	4	24	12
Over 500 trees	0	0	4	7	3

Table 9 Households assets and house construction by teak group

	Teak group					Total
	A	B	C	D	E	
Household assets (% of households)						
Motor bike	28.0	46.2	63.2	75.0	82.8	59.8
Car	4.0	0.0	5.3	3.6	10.3	4.7
Tuk tuk	0.0	3.8	5.3	0.0	0.0	1.6
Boat	20.0	26.9	15.8	17.9	55.2	28.3
Electricity in house	60.0	88.5	78.9	85.7	75.9	78.0
Hand-held tractor	8.0	19.2	15.8	25.0	34.5	21.3
Mobile phone	24.0	57.7	63.2	71.4	89.7	62.2
Television	40.0	61.5	73.7	75.0	72.4	64.6
Refrigerator	4.0	42.3	36.8	50.0	65.5	40.9
Purchase drinking water	8.0	11.5	26.3	35.7	44.8	26.0
Roof of house (% of households)						
Grass	36.0	7.7	10.5	0.0	0.0	10.2
Tile	4.0	3.8	15.8	17.9	20.7	12.6
Iron	60.0	88.5	73.7	82.1	79.3	77.2
House walls (% of households)						
Bamboo	88.0	50.0	47.4	21.4	13.8	42.5
Brick	0.0	0.0	5.3	0.0	3.4	1.6
Cement	8.0	26.9	26.3	39.3	20.7	24.4
Cement and wood	0.0	7.7	5.3	25.0	41.4	17.3
Stone	0.0	3.8	0.0	0.0	0.0	0.8
Wood	4.0	11.5	15.8	14.3	20.7	13.4

Teak Planting and Agrarian Differentiation

The above analysis of survey data suggests that it was the better-off households that had settled earlier, had access to paddy land, had achieved higher education, had off-farm sources of income, were not reliant on shifting cultivation, and were less dependent on cattle that had adopted teak and planted more trees. Table 9 reports indicators of household wealth by teak group. Those households without teak typically had fewer assets and lived in houses constructed of bamboo with a grass-thatch roof. This relative lack of assets was also related to some of the above factors, notably the age of the household head and the household's relocation history. Some of the variation in assets can also be explained by village-level factors, such as that electricity was not connected in Ban Sanok at the time of the survey, the lack of a mobile phone signal in Ban Phatonglom, and a fire in 2003 that destroyed the majority of houses in Ban Phatonglom.

The causal relationships among the variables in Table 9 are complex. Did these households have more assets because they had planted and benefited from teak, or were they able to establish teak plantations because they had more resources to

begin with? It would be too simplistic to conclude that households that had planted teak had benefited from the process, and therefore other households should follow the same 'pathway out of poverty'. While many households had benefited from the early adoption of teak, and commented that they had purchased motorbikes and two-wheel tractors and now sent their children to school with the income teak had generated, the ability of other households to follow this pathway depended on their initial resource endowment.

In Fig. 4 the households in the sample are again classified according to whether they had planted and sold teak. The asset levels of those households that had planted and not yet harvested teak tended to be higher than those of households that had never planted teak, which suggests that household accumulation of wealth is an enabling factor rather than an impact of teak plantations. Nevertheless, early planters who had already harvested some teak tended to have greater wealth than other teak households that had not yet harvested any trees.

Given the low rate of rice self-sufficiency, households that adopt teak face a food shortage problem until the trees can be harvested. For this reason, Hansen et al. (1997) suggested that teak is primarily suitable for wealthier farmers, businessmen and government employees. These authors concluded that one of the main motivations for other upland farmers to plant teak is the possibility of selling the 1–3 year-old plantations to investors. Furthermore, they supposed that since plantations are predominantly established on flatter land next to roads, farmers have lost much of the best agricultural land for the production of cash crops. According to Kolmert (2001), the selling of land recently planted with teak had been occurring even before farmers had the required certificates and resulted in many farmers not having enough land on which to grow food.

During the interviews, households were asked if they had purchased or sold land in the past. Given the sensitive nature of the topic, they were not asked for details

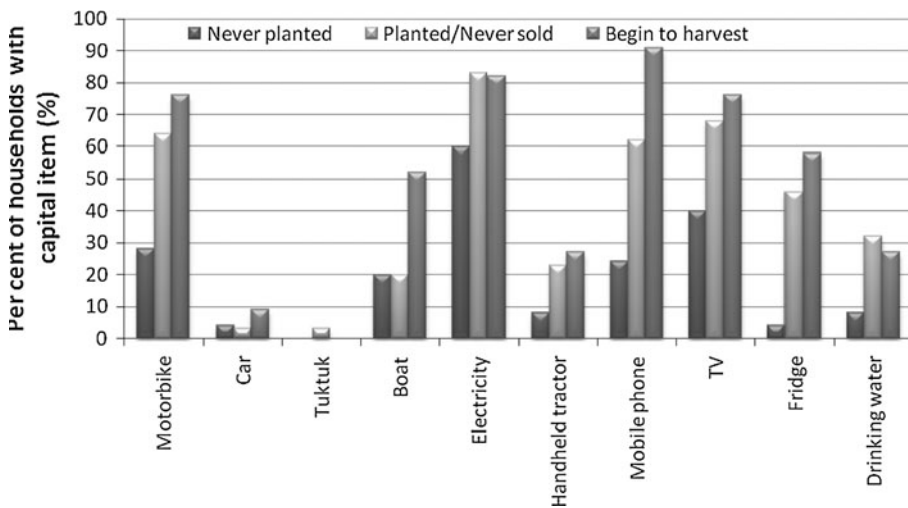


Fig. 4 Household assets by teak growing and harvesting status

Table 10 Land transactions and borrowing by teak group

	Teak group					Total
	A	B	C	D	E	
Purchased land (%)	40.0	34.6	31.6	39.3	34.5	36.2
Sold land (%)	12.0	30.8	15.8	28.6	13.8	20.5
Borrowed money (%)	40.0	30.8	26.3	35.7	13.8	29.1
Source of loan (no. of households)						
Bank	7	6	3	3	2	21
Family	2	0	0	4	0	6
Village fund	1	2	2	3	2	10
Total	10	8	5	10	4	37

about to whom they sold land, although information regarding the number of trees was obtained. For those households that had purchased land, information regarding the land-use of the parcel was also obtained. Overall 36% of households had purchased land and 21% had sold land, with percentages relatively constant across the teak groups (Table 10). These data suggest that households in the survey were purchasing both teak blocks and fallow land that they later converted to teak. Given that the survey did not include absentee landlords, the full extent of land transactions is difficult to quantify. Anecdotal evidence, however, suggests that the scale of land transactions is increasing, with investors looking for land on which to plant both teak and rubber. The money from land sales was reported to be used for school fees, weddings, and to meet healthcare expenses.

Credit was available to farmers in some villages, including loans from the agricultural cooperation bank, village revolving funds and from relatives. The bank interest rate ranged between 12 and 15% per year. Money could be borrowed from the village revolving fund for about 3% interest per month. The incidence of borrowing was higher among non-teak households and those with smaller plantations (Table 10), suggesting that teak plantations (like rubber plantations) substitute for borrowed capital, providing a ‘bank’ to fund household needs as they arise.

Discussion and Conclusions

Smallholder teak plantations have had a long history in Luang Prabang Province and are becoming increasingly important in the process of agrarian change and differentiation. Apart from the buoyant market for teak wood, expansion of teak smallholdings has been influenced by a range of policies that encourage timber production and discourage and restrict shifting cultivation. The land and forestry laws, supported by various government decrees, provide the institutional framework that gives farmers the security of tenure to invest in this long-term land-use option. However, the rapid expansion of smallholder plantations has not been followed by the adoption of recommended management practices. For the most recent wave of

planting in the early 2000s, the optimal time for adopting pruning and thinning is imminent. Survey responses suggest landholders lack knowledge of management practices, especially thinning, hence improved extension should be seen as a high priority. However, farmers will need to be convinced that there are substantial economic returns to improved silvicultural practices before they will allocate scarce labour to practices with a long-term payoff, especially those with larger plantations for whom teak planting is a way of making land productive with less labour.

Households in the case study villages had diverse livelihood sources, hence the ability to integrate teak into the farming system varies between villages and between households within villages. Teak planting has been more extensive among households with a longer history of settlement, where the household head is older and better educated, where household members have off-farm sources of income, and where the household has access to paddy land and is thus more likely to be self-sufficient in rice. For these households, teak planting presents a land-use option that requires less labour input and, if managed effectively, can substantially improve household income. Indeed, it has already done so for early adopters. While these households have more diversified livelihoods and are relatively better off compared to other members of the community, the majority of households included in the survey remain smallholder farming households with low returns to land and labour, and low incomes.

For households that depend on shifting cultivation for their livelihoods, the role that teak plays in their livelihood strategy has changed little since the 1950s. Many of these households reported that they borrowed land for upland rice production on the condition that after harvest they established teak for the owner. The next year they would have to find a new piece of land to grow their crops. However, because the area of teak has expanded, these households reported that they now have to travel further afield, often walking to neighbouring villages and into more remote and steeper country.

Hansen et al. (2005) advocated smaller plantations of 50–200 trees that farmers would be able to maintain with better management techniques and be less likely to sell early. The data presented in this paper suggest that there are few households establishing such small numbers of trees. Therefore, without access to alternative productive land or income sources, maintaining ownership of teak land will continue to be difficult for many households. As permanent land titles are progressively issued, permitting the land to be transacted legally, more households may sell some of their titled land in order to survive. Research by ACIAR and other agencies on teak agroforestry systems that provide short and medium-term cash flow (e.g. under-planting with rattan, intercropping with paper mulberry) may enable a more gradual transition to teak systems for households with little land. However, farmers with alternative livelihood activities and absentee landlords are unlikely to adopt these more diversified and labour-using systems. For these households, the establishment of teak plantations not only represents a source of future income and wealth, but also provides a method for maintaining access to land beyond the area they can physically cultivate. Thus, even with increased research and extension efforts, the boom in teak planting is accelerating processes of agrarian differentiation, with a small group of better-off farmers and urban-based outsiders

capturing the majority of the benefits, while those with greatest dependence on shifting cultivation are actually made worse off through declining access to land.

In conclusion, this research reveals that the establishment and improvement of teak plantations, like other apparently technical interventions aimed at providing a ‘pathway out of poverty’, need to be seen in the context of wider processes of agrarian change and differentiation to appreciate the resultant impacts on livelihood trajectories.

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